

Figure 1 Orr-Sommerfeld growth rate versus wavenumber and Reynolds number

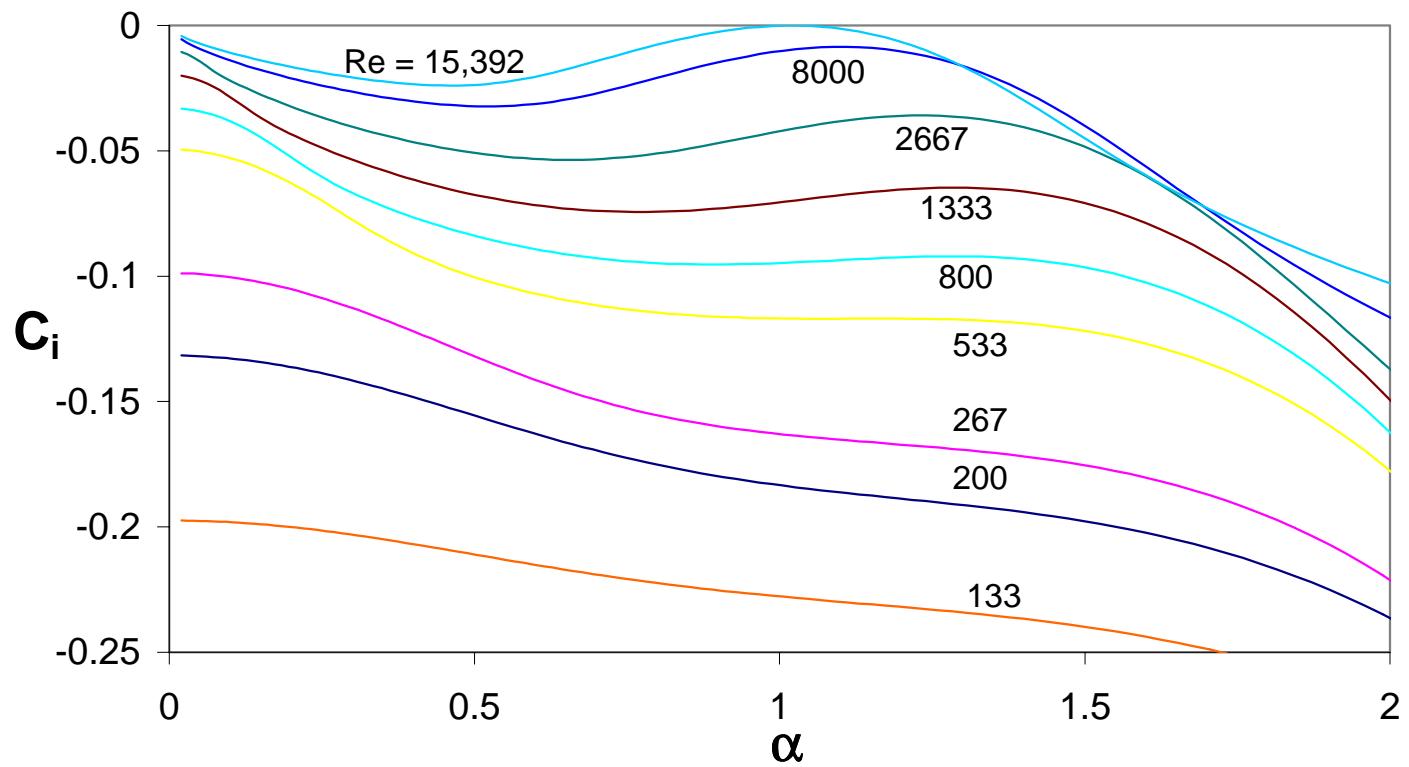
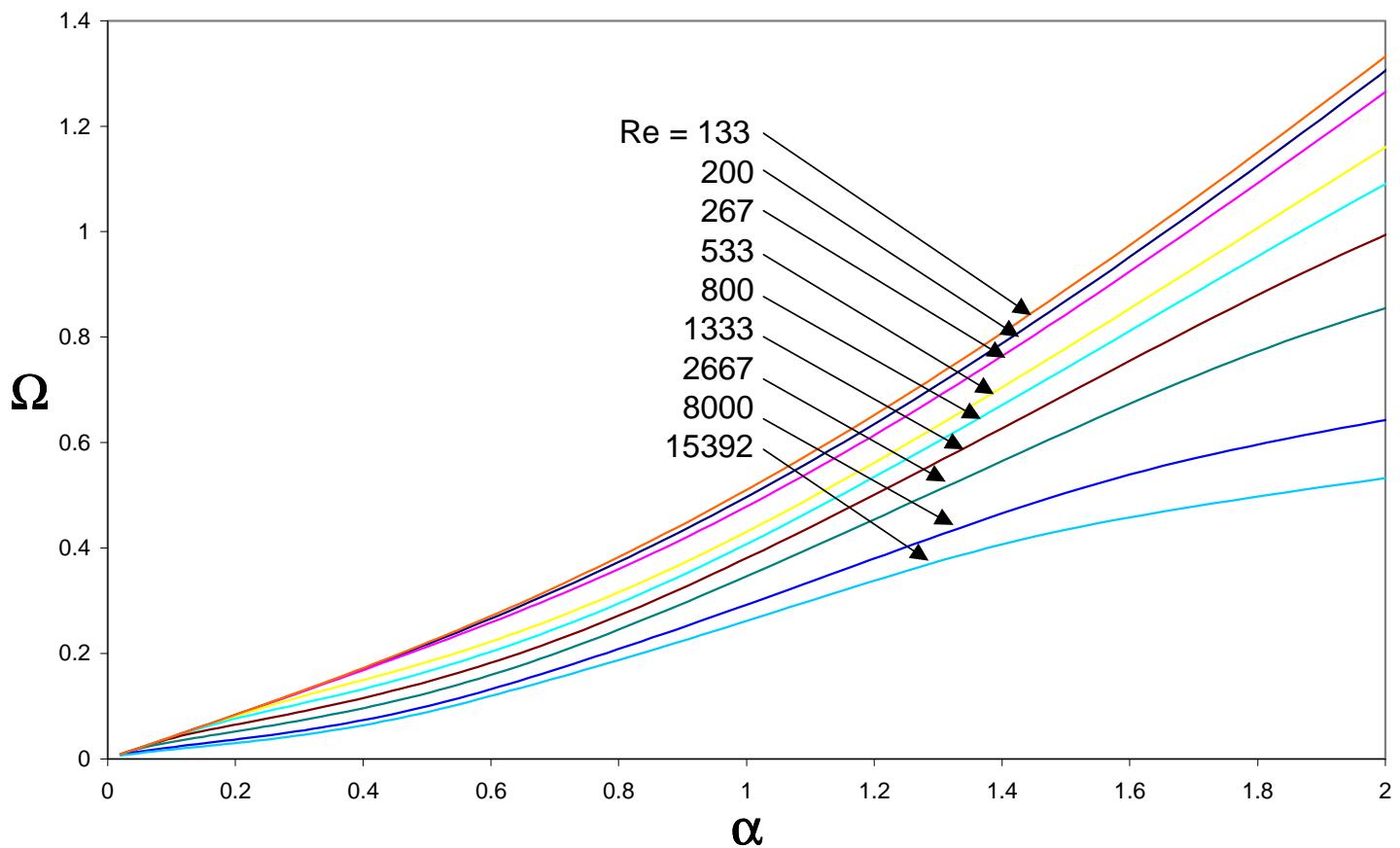


Figure 2 Orr-Sommerfeld frequency versus wavenumber and Reynolds number



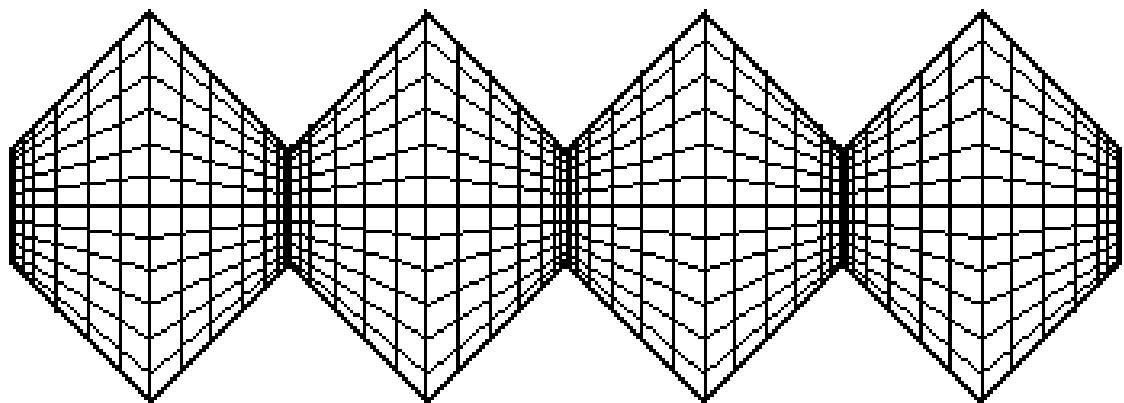
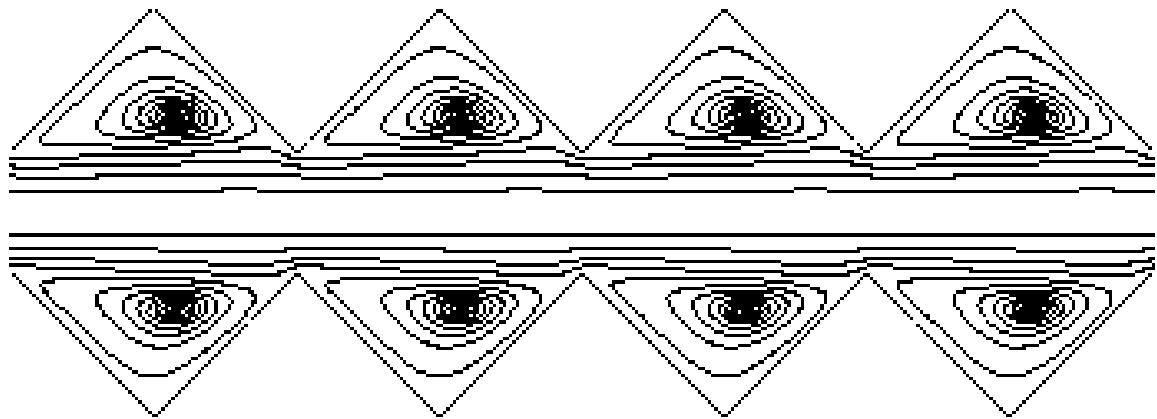


Figure 3 Spectral Element Mesh



**Figure 4 Streamlines for $Re = 267$,
steady forcing**

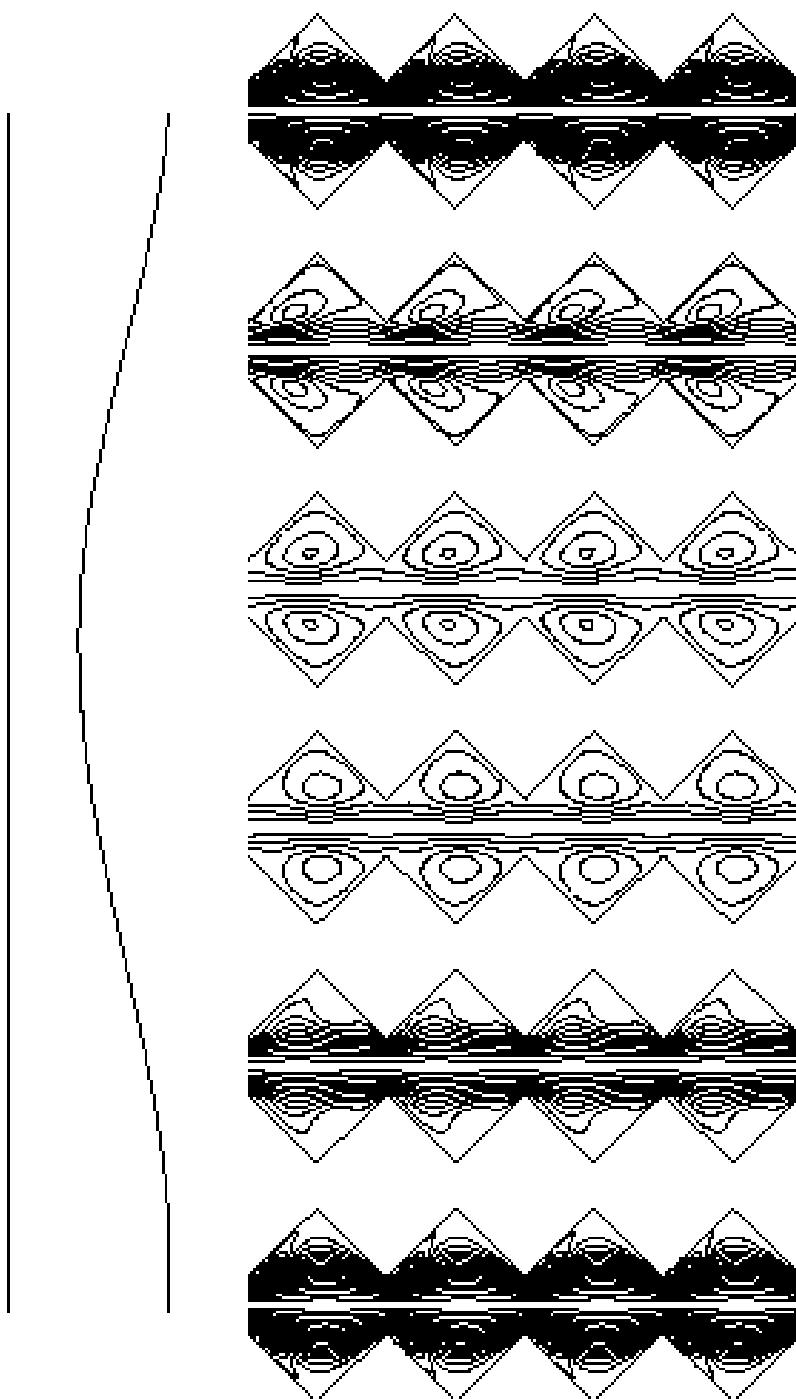


Figure 5 Streamlines at six equally spaced times for $Re = 267$, $\eta = 0.4$, $f = 6 \text{ Hz}$

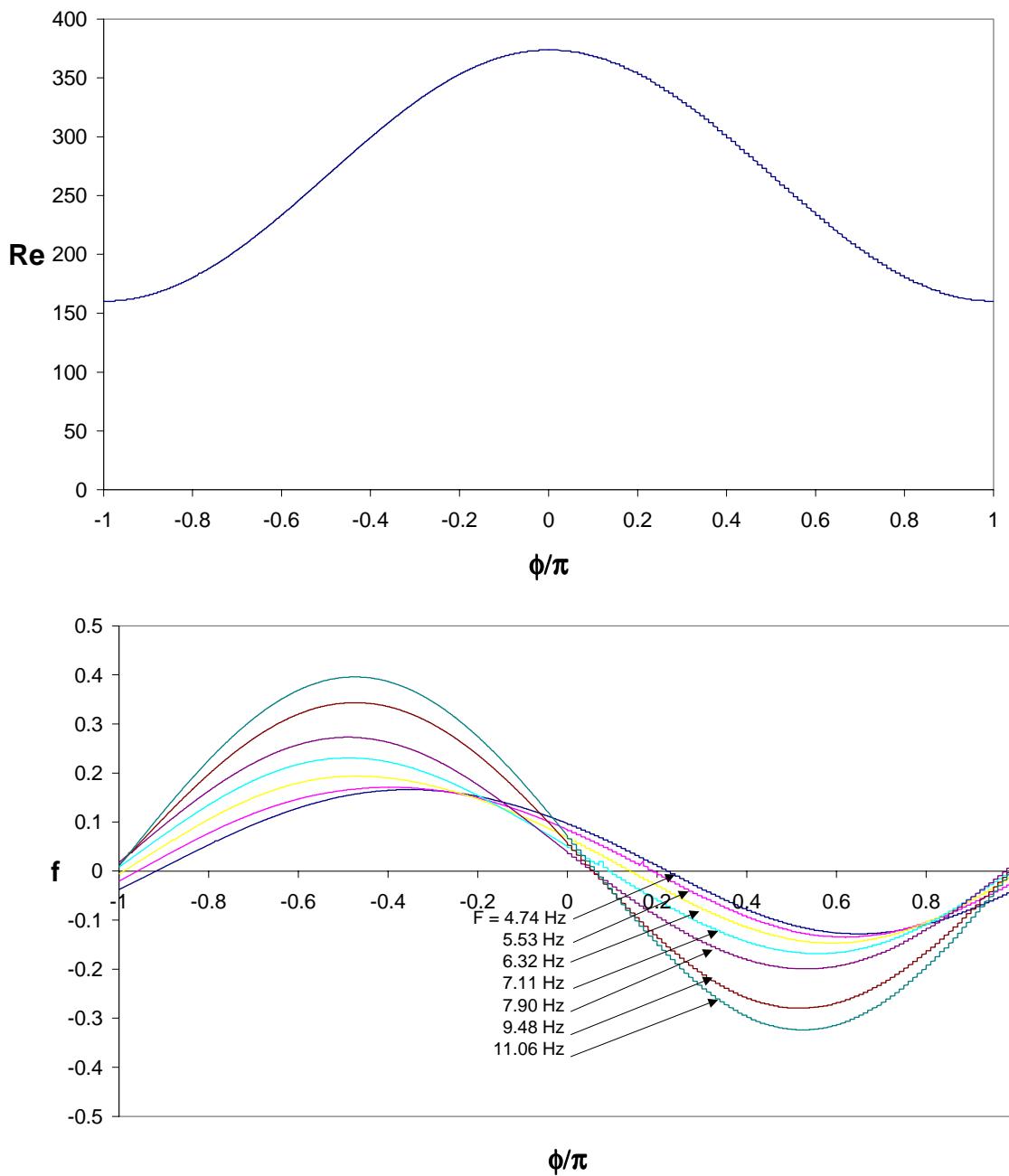


Figure 6 Time dependent Reynolds number and Fanning friction factor versus phase angel for $\text{Re} = 267$, $\eta = 0.4$.

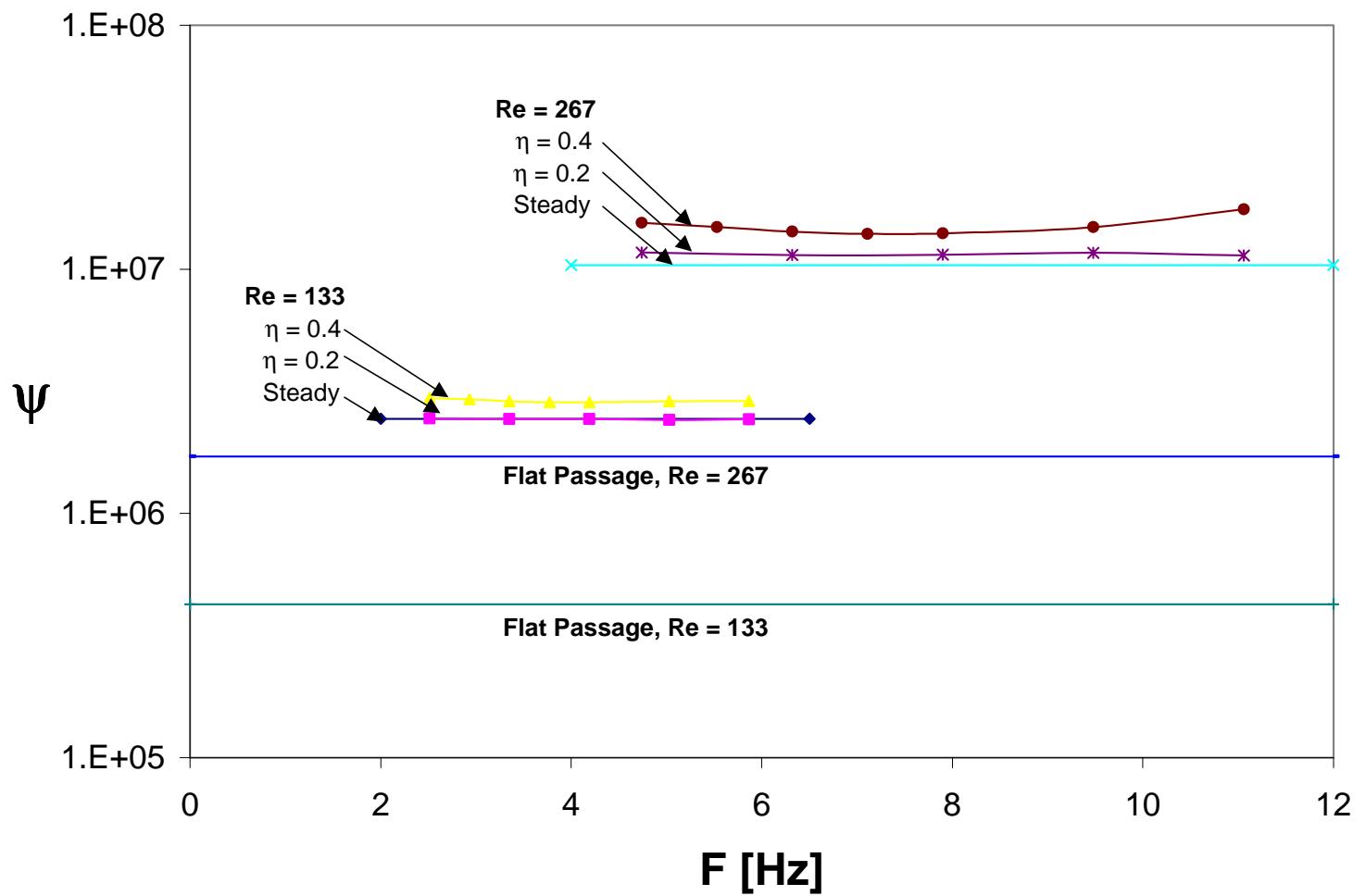


Figure 7 Dimensionless pumping power versus forcing frequency

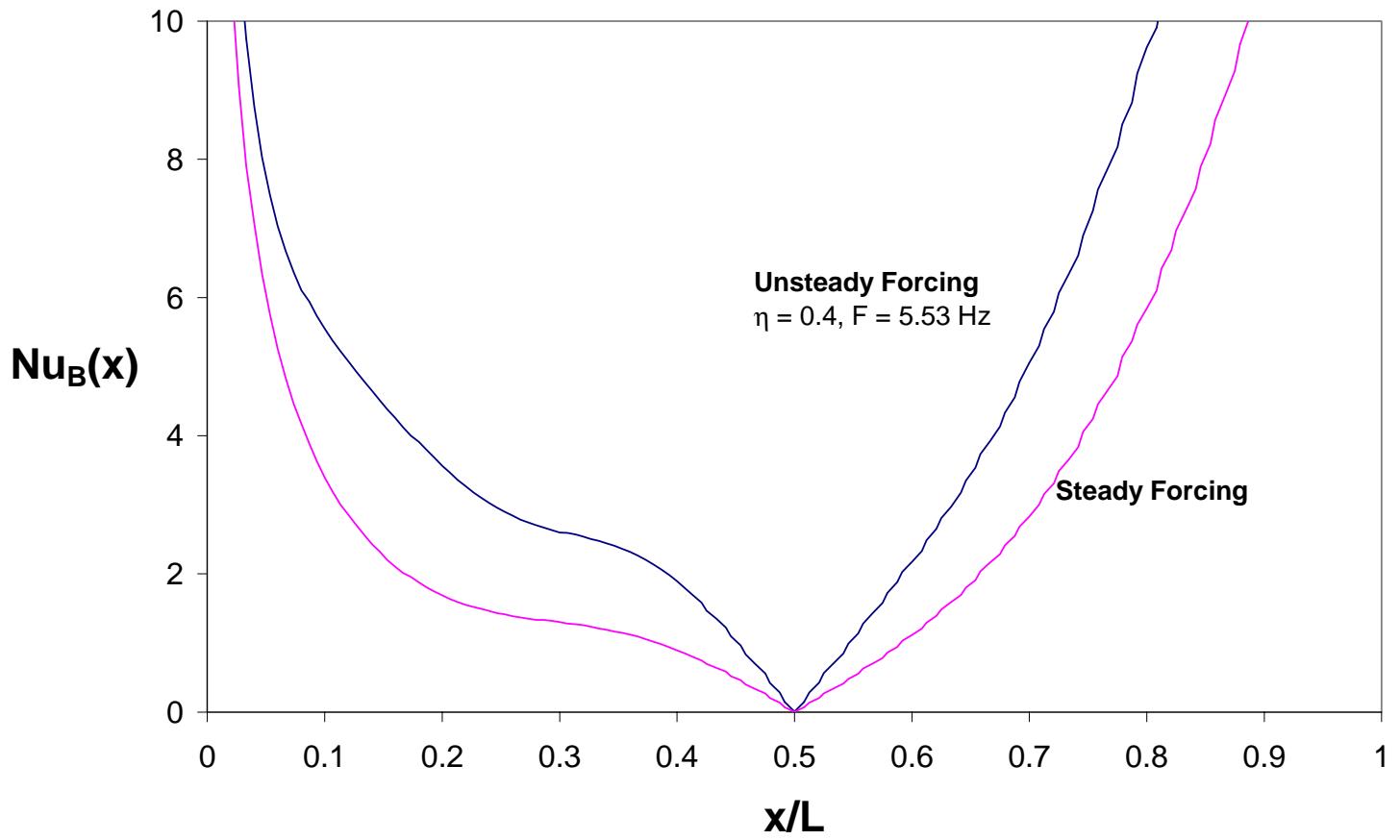


Figure 8 Spatial variation of local Nusselt number in one periodicity length of the passage at $\text{Re} = 267$ with steady and unsteady forcing

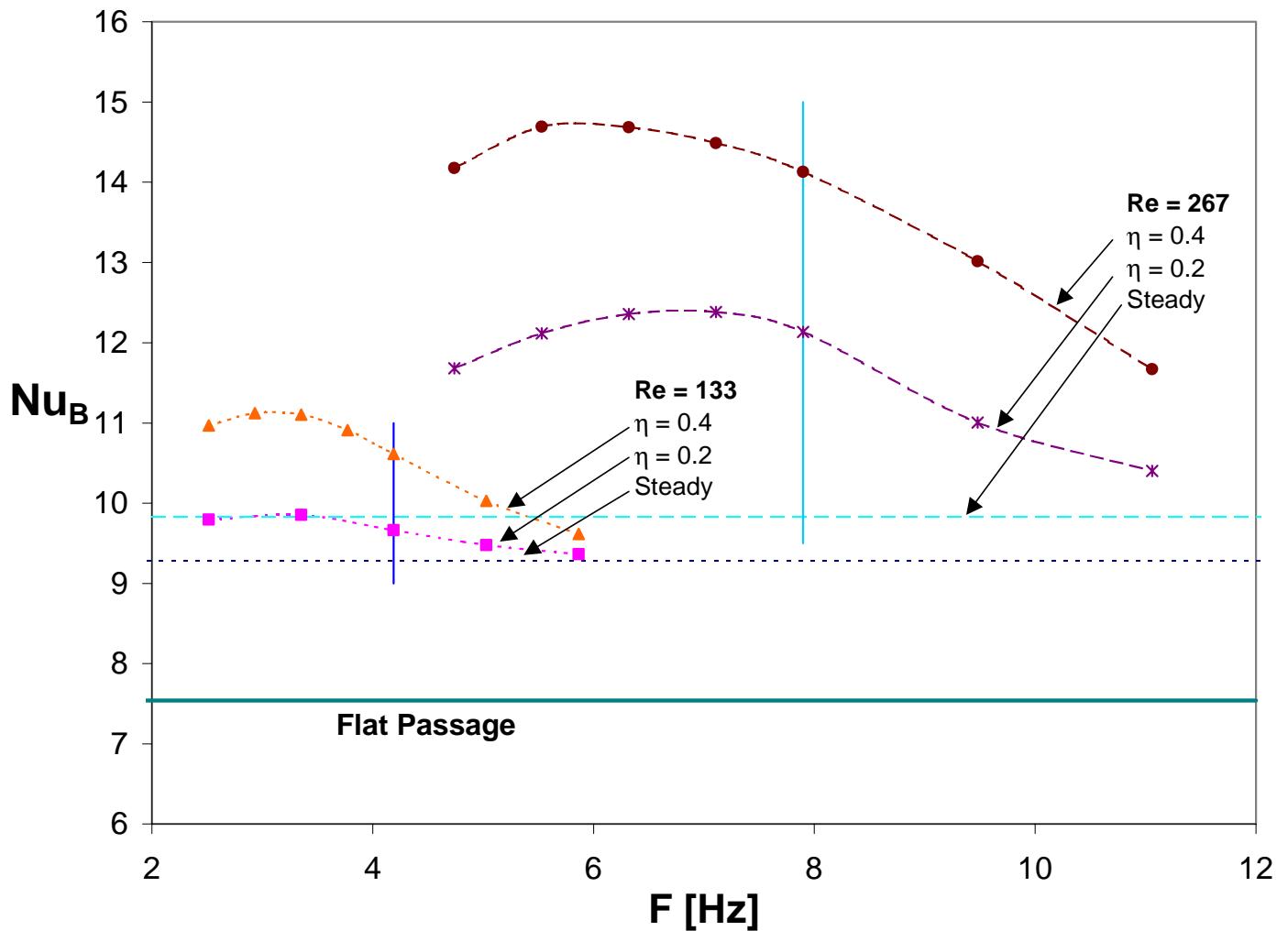


Figure 9 Log mean Nusselt number versus forcing frequency at $Re = 133$ and 267 and $\eta = 0, 0.2$ and 0.4